

Addressing Issues in Cumulative Risk Assessment

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Cumulative risk assessment is a tool for organizing and analyzing information about combined effects of multiple biological, chemical, physical, and psychosocial stressors on human populations and ecological resources. The US EPA commissioned a series of issue papers by external experts to suggest information to be considered by the Agency in developing future guidance in this area. The issue papers addressed the state of the science in combining similar and disparate stressors (chemical, physical, and biological), disaggregating the effects of stressors to reflect an indication of exposure, and gauging the effect on risk estimates due to intrinsic and extrinsic vulnerabilities. Some key concepts expressed in those papers are summarized in this poster.

In general, the papers consider both human and ecological health, recognizing that these are interrelated. An attempt was made in several of the papers to generalize approaches for human and ecological risk assessment. In the first paper, tools for assessing the combined effects from multiple stressors are identified and compared. Approaches for integrating these into cumulative risk assessments are also considered. In the second paper, challenges associated with using biomonitoring data to inform cumulative risk assessment are considered. Use of an array of biomarkers of exposure, susceptibility, and effect to characterize the complex relationships between multiple environmental exposures and important health outcomes is proposed. Asthma and neurobehavioral outcomes are presented as examples of diseases resulting from multiple exposures and complex gene-environment interactions. In the third paper, combined consequences of chemical mixtures for human health and mechanisms of interactive effects are explored. Categories of extrinsic stressors having common effects and other simplifying assumptions are proposed to help in assessing the vulnerability of exposed groups. In the final paper, vulnerability as a function of individual and group resources is explored. A conceptual model for incorporating vulnerability factors into cumulative risk assessment is proposed, and vulnerability factors are categorized for facilitating risk analysis. Also, a unique approach is presented that examines communities as the unit of analysis in measuring their vulnerability, exposures, and responses in cumulative risk scenarios. Results of these papers can contribute toward the transition of EPA risk assessment methodology from a narrow focus on a single

stressor, endpoint, source, pathway, and exposure route to a broader, more holistic approach involving analysis of combined effects of cumulative exposure to multiple stressors via all relevant sources, pathways, and routes.

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